Progress in Wales.

The whole of the sum of 38,000*l.* available under the Local Taxation (Customs and Excise) Act, 1890, is devoted to the purposes of intermediate and technical education, together with an estimated sum of 20,000*l.* raised by rate under the Technical Instruction Acts, 1889 and 1891. In addition to these sums, an amount of over 17,000*l.* is raised under the provisions of the Welsh Intermediate Education Act, 1889, which sum is met by a contribution from the Treasury not exceeding the amount payable out of the county rate, and based upon the efficiency of the schools aided by the local authorities. The total sum which is annually appropriated to intermediate and technical education in Wales is, therefore, about 92,000*l.*

In Cardiff, by an agreement between the Corporation and the University College of South Wales and Monmouthshire, the entire responsibility of providing technical instruction is placed upon the college, in consideration of a large annual grant, together with all fees and grants earned by, or on behalf of, the students. The work of the college in this connection comprises the maintenance of a large number of evening science and art and technical classes, a women's technical department, and a higher technical department, and the establishment of scholarships and studentships.

Expenditure on Technical Education in Scotland.

Of the total amount of 39,000*l.* distributed to local authorities under the Local Taxation (Customs and Excise) Act, 1890, an estimated sum of 28,000*l.* is devoted to technical and secondary education. This, with the addition of an amount of 60,000*l.* available under the provisions of Section 2 of the Education and Local Taxation Account (Scotland) Act, 1892, makes the total sum devoted to technical and secondary education in Scotland 88,000*l.*, excluding those sums which are applied to technical education by six School Boards out of the school fund under the Technical Schools (Scotland) Act, 1887.

The Position of Ireland.

The year 1897 has been one of disappointment to those interested in technical education in Ireland. In February a large and representative deputation, organised by the Technical Education Association for Ireland, waited upon the Lord-Lieutenant. His Excellency, who was much impressed by the influential character of the deputation, and the arguments which they advanced, announced that it was the intention of the Government to introduce a Bill in the coming session which would deal with agricultural instruction, and promised to use his influence with his colleagues to introduce a Bill dealing with technical education at the earliest possible opportunity.

This promise was fulfilled, for not only was a Bill introduced to create a Board of Agriculture and Industries for Ireland, but provision was made in the Budget for an endowment of technical education. But the hopes, which the action of the Government raised, were doomed to disappointment. The Agriculture and Industries (Ireland) Bill, being unfavourably received by the Irish Members of Parliament owing to its financial clauses, was withdrawn; an announcement was made by the First Lord of the Treasury that as an alternative policy a Local Government Bill would be introduced during the following session, and the provision made in the Budget for technical education was otherwise appropriated.

At the end of November a still larger and more representative deputation, organised by the Dublin Chamber of Commerce, and representing all the Chambers of Commerce, the principal municipalities, and the leading agricultural and industrial organisations of Ireland, waited on the Chief Secretary for Ireland and pressed upon the Government the need of establishing a Board of Agriculture and Industries during the forthcoming session. The strongest representations were made as to the urgency of the matter. But the Chief Secretary, though admitting the urgency, informed the deputation that the Government were pledged to the Local Government Bill, and that it would not be fair to buoy up those interested in the movement with the hope that there was any reasonable prospect that the Government would be able to deal with two first-class Irish measures in the one session. The encouraging feature about the situation is that public opinion is thoroughly aroused upon this question, and there is, therefore, no fear that the matter will be allowed to drop.

Early in the year the Lord-Lieutenant appointed a Commission to "inquire and report with a view to determining how far, and in what form, manual and practical instruction should be included in the educational system of primary schools under the Board of National Education in Ireland." The Commission have held sittings in the principal Irish towns, as well as in England and in Scotland, and have sent experts to report upon the position of manual and practical instruction in connection with elementary education in Germany and France. It is expected that their report will be submitted to the Lord-Lieutenant sufficiently early in the year to allow the Government to make provision in the estimates to carry out the recommendations of the Commission.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

PROF. G. KRAUSE, of Halle, has been appointed ordinary professor of botany to the University of Würzburg, in the place of the late Prof. J. Sachs.

AMONG the measures to be laid before the Prussian Diet during the session opened on Tuesday is one on the vexed subject of disciplinary procedure against University Lecturers. In the Speech from the Throne this is alluded to as a "legislative regulation of the circumstances concerning the position of University lecturers."

THE Duchess of Fife opened the new Municipal Technical School at Brighton on Saturday last. The Duke of Fife, replying on behalf of the Duchess to a vote of thanks passed to her Royal Highness, remarked that in establishing the school Brighton had placed itself in line with all the great centres of population in the country, and showed itself alive to the great educational necessity of the day.

SPEAKING at the annual dinner of the Yorkshire College, Leeds, on Friday last, Lord Londonderry said that England was only slowly waking up to the fact that a technical, as distinguished from a commercial or literary, education was becoming more and more essential every day. A great deal had been done by the Yorkshire College, which had to deal with a county vast in its dimensions, and containing within its limits every variety of trade industries. The College had come to the assistance of all these industries. It had rendered valuable assistance to dyeing and weaving as well as to the application of art to the textile industries, and thanks to the grant by the Clothworkers' Company of 50,000*l.* for the establishment of this department, no less than 2500*l.* a year was expended to make the College the first weaving and dyeing school in the country. Many more such institutions as the Yorkshire College are needed before technical education is sufficiently provided for the needs and requirements of the country.

TEACHERS of science and science classes in higher-grade and public elementary schools, held a meeting on Friday last in the rooms of the Society of Arts. Mr. C. J. Addiscott, President of the National Union of Teachers, occupied the chair; and in his opening address he remarked that what is needed at the present time is a sound, workable system of technical instruction, based upon science and art teaching, which itself must be based upon a solid foundation of primary instruction. He discredited the idea that our primary system should be so moulded that it should lead necessarily to a secondary system, believing that the needs of the class with which they had to deal were outside what he conceived to be secondary education, and that the satisfaction of those needs would be found in the development of the primary system through the higher-grade Board school or organised science school on to the technical institute. The main factor for successful progress in this direction must be a central authority, which should be sympathetic, which should know the needs and the difficulties of each class at each stage of the journey. A number of resolutions were passed, one of them being opposed to the recent action of the Science and Art Department in giving instructions to inspectors to report any case where 25 per cent. of the first year students leave the schools at the end of the year, or more than that percentage of the second year students leave at the end of the second year, in order that the department might consider whether such schools should continue to be recognised as schools of science.

THE Association of Directors and Organising Secretaries for Technical and Secondary Education met on Friday last at the Guildhall, Westminster. Mr. C. H. Bothamley (Somerset) was

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elected chairman, Mr. Hewitt (Liverpool) vice-chairman, Mr. J. H. Nicholas (Essex) secretary, and Mr. Turner (Staffordshire) treasurer. The places of the three remaining meetings for 1898 were fixed to take place at Birmingham, Sheffield, and London. In the course of an address, the chairman remarked that the Association had repeatedly expressed its acceptance of the recommendations of the Royal Commission on Secondary Education and had expressed the opinion that they formed a satisfactory basis for legislation. Latterly they had heard a great deal about the essential importance of constituting a central authority for education before anything else was done in the matter. The constitution of an efficient central authority could properly be brought about by the reorganisation of those Government departments that dealt at present with educational matters, a reorganisation along the lines of the Royal Commission's report. They found it to be inconvenient in practice in many ways to have two entirely separate departments, one of which they were brought into contact with in connection with evening continuation schools, and the other more and more frequently in dealing with secondary schools. They wanted to see these two departments merged more or less completely into one, with their functions properly defined, and capable of dealing with secondary education as a whole, as well as with the purely scientific and technical part of it. The other part of the central authority—the educational council—was a body to which the scholastic profession naturally attached great importance. The Association thought that one of the great needs of the present time was a system of schools corresponding fairly closely with the higher primary schools of France—schools which should be a real top to the elementary education. He concluded by moving—"This Association considers that legislation on the lines of the report of the Royal Commission on Secondary Education is very urgently needed at the present time." Mr. Turner seconded, and, after a short discussion, the resolution was adopted.

SCIENTIFIC SERIALS.

American Journal of Mathematics, vol. xx. No. 1, January.—"The motion of a solid in infinite liquid under no force," by Prof. Greenhill, examines the elliptic function expression of all the dynamical quantities involved, and explores the analytical field by working out completely the simplest pseudo-elliptical cases to serve as landmarks, utilising the analysis which the author has developed in his paper on "Pseudo-Elliptic Integrals and their dynamical applications," in the *Proceedings* of the London Mathematical Society (vol. xxv.) and carrying out his work on the lines of his papers on the "Dynamics of a Top" and on the "Associated Motion of a Top and of a Body under no Forces" in vols. xxvi. and xxvii. (*Proc. L.M.S.*). Reference is made to the sketch of the theory in Thomson and Tait's "Natural Philosophy," and to a complete solution in the case of a solid of revolution in Kirchhoff's *Vorlesungen über Math. Physik*, ix.; and to the "Motion of a Solid in a Liquid," by Dr. T. Craig.—"Surfaces of Rotation with constant measure of curvature and their representation on the Hyperbolic (Cayley's) Plane," by G. F. Metzler. Minding (Crelle, vols. 19, 20) shows that it is easy to obtain the formulæ which express the relations between the sides and angles of a triangle of which the sides are geodesic lines on a surface of rotation with constant measure of curvature. Mr. Metzler shows that the same method holds for the formula expressing the area of the triangle (*i.e.* in the ordinary spherical formulæ put $a\sqrt{-1}$ for a, the radius of the sphere).—"Sur les Méthodes, d'approximations successives dans la théorie des Equations différentielles," par E. Picard, is a note, taken by the editors of the *Journal* from M. Darboux's "Théorie des Surfaces (à la fin du tome iv.).—M. Darboux is the mathematician whose likeness accompanies this number.

Bollettino della Società Sismologica Italiana, vol. iii., 1897, Nos. 5, 6.—The microseismographs of the Institute of Physics of the Royal University of Padua, by G. Pacher. A reprint of a paper giving a full account of the Vicentini microseismographs, already noticed in NATURE.—The Latian earthquake of May 8, 1897, by G. Agamennone. A note on a series of slight shocks felt in the neighbourhood of Rome.—The Royal Geodynamic Observatory of Catania, by A. Riccò.—Notices of earthquakes recorded in Italy (April 27–May 14, 1897), by G. Agamennone, the most important being the series of Latian earthquakes of May 8, and an earthquake of distant, but unknown, origin on May 1.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 9, 1897.—"On Methods of making Magnets independent of Changes of Temperature; and some Experiments upon Abnormal or Negative Temperature Coefficients in Magnets." By J. Reginald Ashworth, B.Sc.

The object of this paper was to find what kinds of iron or steel are least liable to changes of magnetic intensity of a cyclic nature under moderate fluctuations of temperature, such as take place in the atmosphere from one season to another. The subject is of importance for the sake of improving magnetic instruments, but apart from its practical consequences the investigation points to some interesting theoretic consequences.

In general the effect of alternately heating and cooling a magnet is to cause a large loss of magnetic intensity, which is only in part recovered; ultimately a cyclic state is established in which the changes may be expressed by a formula which in conformity with custom is here written $I_t' = I_t (1 - \alpha \overline{t' - t})$, I standing for the magnetic intensity, t and t' for the cold and hot temperatures.

Hitherto α, the temperature coefficient of the magnet, has been found to be positive; that is to say, the effect of a rise of temperature is to diminish, and a fall of temperature to increase the magnetic intensity. A negative coefficient must be understood, therefore, to represent a rise and fall of magnetic intensity with rise and fall of temperature, and this abnormal effect has now for the first time been observed to be general in certain cases.

In the first place the influence of chemical composition was sought in determining the behaviour of a magnet under changes of temperature, and steel alloys severally of manganese, tungsten, cobalt, and nickel were tested, as well as a series of cast irons of different blends of pig irons. The results obtained show that the influence of chemical constituents is subordinate to that of physical condition, annealing or hardening. Thus a kind of nickel steel, the same as Dr. Hopkinson found to yield such remarkable thermo-magnetic results, exhibited in the glass-hard state a small increase of magnetic intensity with increase of temperature and decrease with fall of temperature. When annealed the converse effect took place, and these effects could be changed repeatedly by changing from hard to soft and soft to hard. Again cast iron, in the condition received from the foundry, has a very large magnetic variation for a given range of temperature, but when hardened by heating and rapidly chilling the variation becomes exceedingly small, the coefficient now being about $\frac{1}{15}$th its former amount. As hardened cast-iron magnets have also a very high permanent magnetic intensity, and are very little influenced by shocks and blows, it will be seen that they have exceptionally valuable qualities.

However, the most interesting results were obtained from some steel music wires which happened to be put to the test. These wires in the normal condition and when the cyclic state is established, after experiencing the usual permanent magnetic loss, exhibit a negative coefficient, the higher and lower intensities now corresponding to higher and lower temperatures, and they are thus quite exceptional. But, in contrast with the similar behaviour of the nickel steel alloys just mentioned, the negative coefficient is destroyed and a positive coefficient established if the wire be raised to a bright red heat and cooled either very slowly, as in the process for annealing, or rapidly as for hardening. If heated, however, to about a dull red and quenched, the coefficient can then be rendered just zero.

In order to gain some insight into the cause of this abnormal negative coefficient, the wire was dissolved in nitric acid and at different stages of dissolution tested. This led to the important relation, which was afterwards fully established in every possible way by a series of laborious experiments, that the longer and thinner the wire the more negative is its coefficient; and so much does the coefficient depend on the ratio of length to diameter, or dimension ratio, that by suitably altering the dimension ratio the sign of the coefficient may be changed; and for some particular dimension ratio, for a given kind of steel wire, the coefficient may be made zero, and the magnet is then independent of temperature changes.

The diagram exhibits these changes graphically. Curve (1) represents the variation of the coefficient from positive to negative for steel music wire of diameter 0·187 centimetre, and of

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